

Regulation of the Lactase Gene



About This Worksheet

This worksheet complements the Click and Learn "Regulation of the Lactase Gene" developed in conjunction with the 2011 HHMI Holiday Lectures on Science "Bones, Stones, and Genes: The Origin of Modern Humans."

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Key Concepts

- Eukaryotic gene expression is regulated at the levels of transcription, RNA processing, translation, and post-translation.
- Proteins called transcription factors bind to DNA and control transcription. Different types of transcription factors can increase or decrease transcription.
- Mutations in DNA regions that control gene expression can alter the way genes are expressed.
- Infants have high lactase levels so that they can digest their mothers' milk, but lactase gene expression is turned off after weaning.
- Lactase persistence is the trait that allows adults to continue to digest milk. It results from a mutation in an enhancer region of the lactase gene.

Instructions

1. Go to BioInteractive.org.
2. In the menu bar under the masthead, mouse over Topics → Evolution → Interactive.
3. Scroll down the page and click on "Regulation of the Lactase Gene."
4. Proceed through the slides, watch the embedded video clips, and answer the following questions in the space provided.

Questions

1. What is the difference between lactose tolerance and lactose intolerance? Be specific.

Lactose tolerance: Ability to digest lactose due to sufficient lactase enzyme production.

Lactose intolerance: Inability to digest lactose due to insufficient lactase enzyme production.

2. Why is lactose tolerance also called lactase persistence?

Lactose tolerance is termed lactase persistence due to continued lactase enzyme production into adulthood.

3. In which cells or tissues is lactase produced and what is its role?

Lactase is produced in epithelial cells of the small intestine and aids in lactose digestion

4. What normally happens to the levels of lactase produced throughout a person's lifetime?

Lactase levels typically decline after infancy and childhood in most individuals.

5. In general, why is it important for a cell to regulate protein production?

Regulating protein production ensures proper cellular function, response to signals, and adaptation to environmental changes, crucial for cellular health.

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